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**REPORT ON INVESTIGATION OF FIRE AT UCNC, Y-12 PLANT,  
BUILDING 9766 ON MARCH 21, 1962**

**Y-12 PLANT**

**UNION CARBIDE NUCLEAR COMPANY**

**DIVISION OF UNION CARBIDE CORPORATION  
OAK RIDGE, TENNESSEE**

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M.R. Theisen, EAS  
6-26-97  
Date



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REPORT OF THE INVESTIGATING COMMITTEE  
ON THE  
FIRE AT OAK RIDGE, TENNESSEE  
Y-12, BUILDING 9766,  
MACHINE HOOD, DUCT SYSTEM AND FILTER HOUSE  
MARCH 21, 1962

OAK RIDGE, TENNESSEE  
DATE OF SUBMISSION: APRIL 6, 1962

NAMES OF COMMITTEE:

H. B. Mills, Chairman - AEC, Safety Branch  
R. L. Hervin, Member - AEC, Research and Development Division  
W. O. Elam, Member - UCNC, Y-12 Plant  
J. M. Googin, Member - UCNC, Y-12 Plant  
J. T. Blackmon, Member - UCNC, Y-12 Plant  
F. V. Tilson, Member - UCNC, Y-12 Plant  
J. D. McLendon, Member - UCNC, Y-12 Plant  
H. N. Benninghoff, Member - UCNC, Y-12 Plant

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## I. APPOINTMENT OF COMMITTEE

Pursuant to instructions contained in the ORO Manager's Memorandum (Appendix A) dated March 22, 1962 which appointed a committee of investigation into the fire at UCNC, Y-12 Plant, Building 9766 on March 21, 1962, the committee convened at the scene at 9:30 A.M., March 23, 1962. All members were present. Subsequently, on March 27, 1962, designated members of the committee interviewed witnesses. From the inspection and the interrogation of witnesses it is believed that the following is a factual report of the incident.

## II. SUMMARY

On March 21, 1962 a fire occurred in a Norton grinder in the northwest section of Building 9766 and quickly spread through the duct system and involved the filters in the detached filter house located on the outside and north of the building. Heat from the ductwork ignited the underside of the roof decking and attic wall of this wooden structure. The fire in the filter bank was extinguished with water from the booster tank of a Fire Department pumper and from a hydrant hose line. The attic fire was controlled by water from the sprinkler system and was completely extinguished with water from hose lines. The fire in the grinder was kept under control with water from the sprinkler system and extinguished with CO<sub>2</sub> from two 15-pound fire extinguishers. Damage by replacement and cleanup is estimated at \$24,700. There were no injuries.

## III. BASIC INFORMATION

### A. Description of Facility

Building 9766 is a one-story frame, sprinklered structure, with a high bay and having approximately 35,457 square feet. It is divided by firewalls and is located in the plant area as indicated on the marked plot plan (Appendix G). The west section only (12,400 square feet) was involved in the incident. It had been in use as a machine shop for approximately eleven years and it was originally set up with some twelve machines for the dry machining of beryllium metal. These machines included plain lathes, mills, and drill presses. Since the beryllium work was to be done dry, the building was equipped at the outset with a high-capacity, filtered exhaust system for dust collection. Machine turnings were collected in intermediate baffled traps.

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There were originally associated areas not included in the beryllium area proper. These areas were used for support functions such as drill and tool sharpening, and wheel dressing. The north passageway, where the incident of March 21, 1962 occurred, was one of these areas. It was made a part of the beryllium area in 1958 and was used for processing BeO. Several grinders of different types, the Sheffield Cavitron, and other machine tools were used in this area for the BeO work. Most of these machines were equipped with sturdy hoods which were connected to the central exhaust system. When the BeO work was completed in 1959, the machines were left in this area, and have been used since then for a variety of materials where safety and health requirements necessitated the use of hooded machines. A pyrophoric material was processed in this area since a grinding operation in a hooded machine was required. Such equipment was available without modification. It was not uncommon to use this equipment for special production of this type.

The filter house located on the north side contained twenty Type 1G CWS absolute filters (UCNC, Y-12 Catalog No. 076440392) and essential prefilters of a metal type (Appendix E, filter house photographs).

B. Normal Contamination Controls

The west portion of Building 9766 has been established as a regulated contamination zone due to extensive operations with beryllium. The following controls were in effect prior to the incident:

- (1) The area is isolated and personnel access limited.
- (2) A separate ventilation system was installed which provides eight air changes per hour within the shop.
- (3) All machines are hooded and exhausted through absolute filters.
- (4) Water holdup tanks are provided to permit controlled disposal of contaminated aqueous wastes.
- (5) Twenty-nine air samplers are installed throughout the area for continuous sampling. One sampler in the exhaust duct of the filter house serves to verify the integrity of the absolute filters.
- (6) Operational and breathing zone air samples are taken, as the need occurs, to define and eliminate individual problems.
- (7) Periodic smears are taken as a measure of spread of contamination and cleanup requirements.

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- (8) Eleven outside area-wide air samplers are analyzed weekly for Be, as well as other cations, anions, and radioactive materials.
- (9) Complete clothing change is required for assigned personnel. Surface clothing (coveralls and/or lab coats) and shoe covers are provided for visitors. All used clothing is wet down prior to release to the laundry for washing.
- (10) All personnel are screened and approved by the Medical Department prior to assignment. Followup X rays are required as a routine check on personnel exposure.
- (11) Controlled eating and smoking facilities are provided within the regulated zone.

C. Story of the Fire (Appendices B and C)

On March 21, 1962, at approximately 4:30 P.M., a machine cleaner started to remove dust and clean a grinder in the shop area in a room in the northwest section of Building 9766. This machine had been used over a period of several weeks to grind the surface of a material which produces a pyrophoric dust. The grinder was enclosed in a plexiglass hood and perchloroethylene coolant was used during the grinding operation. Appendix F, Figures F-1 and F-2, gives views of this hooded grinder. When the cleaner advanced the stainless steel nozzle of the vacuum cleaner into the enclosure, a moderate explosion occurred and the inside of the hood was immediately in flames. The cleaner threw down the vacuum hose and ran out of the room into the main shop area. The Shop Foreman, who was in the main shop area, heard the explosion, looked in the room, and saw the fire. He instructed a building employee to pull a fire alarm box and proceeded to a telephone to call the Fire Department. The fire alarm was received over the alarm system at 4:37 P.M. The Fire Department responded with a 1000 gpm pumper, emergency truck, and ambulance. Auxiliary firemen responded from elsewhere in the plant. In approaching the building, the firemen saw the bank of filters outside the building on the north side completely enveloped in flames and proceeded to that location. Appendix E, Figures E-4 and E-5, shows views of the filter bank. The booster line from the pumper was used on the fire until a 50-foot section of 2 1/2-inch hose, "Y"ed to two 150-foot sections of 1 1/2-inch hose, could be put into operation from a fire hydrant. The filter fire was brought under control in a matter of minutes. At about this time the sprinkler system motor gong on the outside of the building started to ring, which indicated that the building sprinkler system had actuated. Firemen then entered Building 9766 and found the fire burning inside the grinder hood. The sprinkler head located above the hood controlled the fire, as can be seen

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in Appendix F, Figure F-1. The sprinkler system was turned off momentarily and this fire was extinguished with two CO<sub>2</sub> fire extinguishers. A short time later the odor of burning wood was detected and the sprinkler system was turned back on. The burning wood odor was traced to the attic where a small fire was seen around the juncture of the low roof with the high bay. The fire could not be reached readily from inside the attic so firemen went outside and gained access to the first level of the roof by ladder and removed a window from the high bay to get at the fire. The sprinkler system was turned off again and complete extinguishment was accomplished with water from the 1 1/2-inch hose lines. The attic fire was started from the overheated duct above a drop ceiling on the underside of the first-level wooden roof deck. The fire traveled horizontally between roof joists, see Appendix F, Figure F-3, and vertically to the high bay roof, and actuated a sprinkler head. Appendix F, Figure F-4, shows the vertical travel of the fire and the location of the sprinkler head. The fire was out and the all clear given at 6:08 P.M.

D. Extent of Property Damage (Appendix D, Form AEC-283)

Damage to machine exhaust system due to the fire is as follows:

- (1) The duct from the Norton grinder to the filter house became unsoldered.
- (2) The 50-hp fan and motor were destroyed.
- (3) The internal filter frames and filter house walls and ceiling were cracked beyond economical repair.
- (4) Exhaust stack had two holes which required repair.

Damage to building due to the fire is as follows:

- (1) Water damage to 1600 square feet of suspended ceiling.
- (2) Water damage to 1600 square feet of insulation.
- (3) Replacement of 150 square feet of the roof.
- (4) Insulation burned off open electrical bus in the attic.
- (5) Feeder to 50-hp motor on ventilation system destroyed.
- (6) Electrical feeder to grinder destroyed.
- (7) Replacement of all conduit on filter house including light, float switch, and telephone circuits.

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Damage to tool machines:

- (1) Replacement of two grinder motors and the grinder hood.

Loss of use:

- (1) Critical delivery schedules required the transfer of two machine operations to other facilities within the Plant. Other work was satisfactorily delayed pending rehabilitation. In the interim, personnel had been reassigned to operations in other shops where high back logs of work existed.

The following components of the filter house, although damaged, did not contribute to the severity of the fire.

- (1) The metal enclosure.
- (2) The absolute Cambridge Corporation Type 1G final filters with fire resistant plywood frame and glass-asbestos filter media.

## Signatures of the Committee Members:

H. B. Mills  
H. B. Mills, Chairman - AEC, ORO  
Construction and Engineering Division

H. N. Benninghoff  
H. N. Benninghoff, Secretary - UCNC, Y-12 Plant

R. L. Hervin  
R. L. Hervin, Member - AEC, ORO,  
Research and Development Division

W. O. Elam  
W. O. Elam, Member - UCNC, Y-12 Plant

J. M. Googin  
J. M. Googin, Member - UCNC, Y-12 Plant

J. T. Blackmon  
J. T. Blackmon, Member - UCNC, Y-12 Plant

F. V. Tilson  
F. V. Tilson, Member - UCNC, Y-12 Plant

J. D. McLendon  
J. D. McLendon, Member - UCNC, Y-12 Plant



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APPENDIX A

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OPTIONAL FORM NO. 10  
5010-104

UNITED STATES GOVERNMENT

## Memorandum

TO : Committee Members

DATE: March 22, 1962

FROM : S. R. Sapirie, Manager  
Oak Ridge Operations

SUBJECT: COMMITTEE TO INVESTIGATE INCIDENT

EES:HBM

In accordance with AEC Manual Chapters 0502 and 0703, the following listed personnel are appointed to a Committee for the investigation of the fire in Building 9766, which occurred on March 21, 1962, at approximately 4:45 p. m., and caused damage tentatively estimated to exceed \$5,000.

✓ R. B. Mills, Chairman - AEC, Safety Branch

R. L. Hervin, Member - AEC, Research & Development Division

W. O. Elam, Member - UCNC, Y-12 Plant

J. M. Googin, Member - UCNC, Y-12 Plant

J. T. Blackmon, Member - UCNC, Y-12 Plant

F. V. Tilson, Member - UCNC, Y-12 Plant

J. D. McLendon, Member - UCNC, Y-12 Plant

H. M. Benninghoff, Member - UCNC, Y-12 Plant

The Committee will endeavor to determine the most probable cause of the incident. The report should conform to the outline set forth in the above-mentioned AEC Manual Chapters. It should be clear, concise, factual, and adequately supported by witnesses statements, photos, etc., and practical recommendations should be made for the prevention of a recurrence in a similar operation or any other pertinent recommendations that would tend to have diminished the severity of the incident.

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Committee Members

- 2 -

March 22, 1962

The Committee will convene at the Y-12 Fire & Guard Department  
Headquarters at 9:30 a. m., March 23, 1962.

*E. J. Wende*  
for S. R. Sapirie

CC: All Committee Members

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APPENDIX B

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Witness statement of Mr. L. C. Burnette concerning the fire incident in Building 9766 during the afternoon of March 21, 1962.

Statement of Mr. L. C. Burnette:  
March 27, 1962

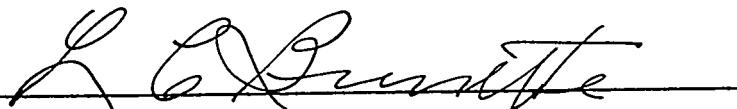
Mr. Burnette: "Mr. J. P. Young assigned me the job of cleaning up the machine. (See Appendix A.) About 4:20 P. M. I set up a vacuum cleaner and drum. The rule is to vacuum dust off machines in the shop area according to normal routine.

I took the hose nozzle and injected it into the grinder hood. It exploded as soon as it contacted the metal (powder). Noise and flame was observed from the hood.

As soon as the explosion happened, I ran out of the way to the main shop area and stayed there about a minute and everyone else was 'leaving out' and the guard told us to 'get out' and I ran outside the building.

I was in the grinding room alone at the time of the incident."

Signature of Witness  
March 28, 1962

A handwritten signature in cursive script, appearing to read "L. C. Burnette", written over a horizontal line.

Present during statement of witness: H. N. Benninghoff, UCNC; W. O. Elam, UCNC; R. L. Hervin, AEC; F. V. Tilson, UCNC; and J. P. Young, UCNC.

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APPENDIX C

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*Fire & Explosion*

REPORT OF EMERGENCY *Spent Trench Janitor*

DATE <i>March 21, 1962</i>		ALARM <i>4:37 p.m.</i>	CLEAR <i>6:08 p.m.</i>	REPORT NO. <i>Janitor</i>		
CLASSIFICATION		TYPE	ALARM	RECEIVED BY		
<input checked="" type="checkbox"/> Emergency <input type="checkbox"/> Drill <input type="checkbox"/> Service Call <input type="checkbox"/> Needless <input type="checkbox"/> Accidental		<input checked="" type="checkbox"/> Fire <input checked="" type="checkbox"/> Explosion <input type="checkbox"/> Release <input type="checkbox"/> Rescue <input type="checkbox"/> First Aid	Box No. <i>353</i> Telephone _____ Telephone _____ Radio _____ Other _____	LOCATION Area <i>4-12</i> Building <i>09766</i> Street _____ Vehicle _____ Other _____		
WEATHER <i>Good</i>		ROAD CONDITIONS <i>Good</i>				
CAUSE OF EMERGENCY						
<p><i>Probably a spark from a vacuum cleaned hose with a stainless steel tip caused dust that was to be removed to explode and ignite.</i></p>						
DETERMINED BY <i>Steve Turner - Fire and Guard Supervisor</i>						
DAMAGED		CAUSE		DEGREE		
Building(s)						
Equipment						
RESPONSE BY		EQUIPMENT USED				
VEHICLES	DRIVERS	VEHICLES	HOSE	HYDRANT	EXTING.	OTHER
<i>Pumper #1</i>	<i>B. Hicks</i>					
<i>Emergency Truck</i>	<i>E. J. Kendrick</i>					
<i>Rescue Truck</i>	<i>C. A. Cook</i>					
<i>Car 371</i>	<i>R. Turner</i>					
<i>Car 5336</i>	<i>J. W. Doone</i>					
<i>Cardon Truck</i>	<i>E. J. Kendrick</i> (card on back foot)					
OFFICER RESPONSE		EMERGENCY DIRECTOR AT SCENE				
<i>R. Turner, J. W. Doone</i>		<i>W. O. Elam &amp; E. J. Gues</i>				
OFFICER-IN-CHARGE		EQUIPMENT PERFORMANCE (Describe failure, damage, repairs, replacements):				
<i>R. Turner</i>		<i>P. S. D. Bright and Smyth</i>				
<i>Good</i>						

UCN-570  
(123 7-59)

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at 4:37 P.M. 3 21-67 fire alarm box 353 for building 9766 came in over the Barnwell system. Firemen and auxiliary firemen responded finding the B.E. filter house on fire. A dust on grinding machine burning, the overhead joint and roof boards also on fire. The booster line from pumpers was used on the fire until a 50 ft. section of 2 1/2 inch fire hose wyeed to two 150 ft. sections of 1 1/2 inch fire hose with water fog nozzles could be put into operation from fire hydrant 316 to control the filter. At about this time the sprinkler system motor going on the outside of the building started to bring which indicated that the sprinkler for this building had actuated. Firemen then entered Bldg. 9766 and found the fire still burning on the grinder. The sprinkler system was turned off and this fire was extinguished with two 15 lb CO2 fire extinguishers. The head was replaced and the sprinkler system placed back in service. The attic was then checked and a small fire located in the space which actuated another automatic sprinkler head, confining the fire, until extinguishment could be completed by firemen who removed a window and cut a small hole in the roof and then used water from the fire hose lines to extinguish. Investigation revealed that as the cleaner inserted his vacuum cleaner hose with a stainless steel tip into the grinding machine to remove the dust an explosion and fire occurred. The amount of damage was undetermined. A guard was placed on the north side of 9766 for fire watch and security. All clear was given at 6:08 P.M. Sprinkler system placed back in service.

REPORTED BY

DATE

FIRE CHIEF

Name Jones

3-21-67

DISTRIBUTION:

all equipment was back in service and fire alarm box 353 was removed and reset at 6:20 P.M.

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APPENDIX D

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Form AEC-283  
(3-64)

U. S. ATOMIC ENERGY COMMISSION

Form approved.  
Budget Bureau No. 33-B065.1.

## REPORT OF FIRE OR SIMILAR INCIDENT

## 1. GENERAL

(a) Operations Office Oak Ridge, Tennessee Y-12 Plant	(b) Contractor having custody of damaged property (If subcontractor, also state contractor) Union Carbide Nuclear Co.
(c) Type of activity (Check one) <input type="checkbox"/> Construction <input type="checkbox"/> Government <input checked="" type="checkbox"/> Production <input type="checkbox"/> Research <input type="checkbox"/> Services <input type="checkbox"/> Other	
(d) Location of incident Building 9766	(e) Date of incident March 21, 1962
(f) Time of incident 4:37 P.M.	

## 2. TYPE OF INCIDENT

Check type(s) of incident. If fire follows explosion, check both "Fire" and "Explosion." If other types follow fire, check only "Fire."

☒ Fire ☒ Explosion ☐ Lightning ☐ Windstorm ☐ Sprinkler leakage ☐ Flood ☐ Other

3. PERSONAL INJURIES	NUMBER	4. LOSS	GOVERNMENT	OTHER
(a) Fatality	None	(a) Building	\$	\$
(b) Disabling injury*	None	(b) Building contents (See Committee Report)		
(c) Non-disabling injury	None	(c) Other		
(d) Total	None	(d) Total	\$ 24,700.00	\$

## 5. IDENTIFICATION AND DESCRIPTION

For small fires controlled in early stage, building construction and finish need be given only if they contributed to the origin and assisted or retarded the spread of the fire.

(a) Building name	(b) Building number	(c) Owner
(d) Occupancy	(e) Length	(f) Width
(g) Height (stories)	(h) Roof	(i) Roof covering
(j) Sheathing	(k) Exterior walls	(l) Interior walls
(m) Partitions	(n) Floors	(o) Other

(p) Point of fire origin (room, floor, wing, etc.)  
Building 9766

## 6. CONTROL

(a) How discovered By Building Employee	(b) How reported Fire Alarm Box 353
(c) Number, size, and type extinguishers used Two 15 lb. CO <sub>2</sub> extinguishers	(d) Number sprinklers opened Two
(e) Number and size hose streams Two 1-1/2 inch	(f) Time fire was out 6:08 P.M.
(g) Time fire protection restored 6:08 P.M.	

## 7. DESCRIPTION OF DAMAGE

(a) Building	See Committee Report
(b) Building contents	See Committee Report
(c) Production interruption	See Committee Report
(d) Other	

\*Permanent total, permanent partial disability, or one which incapacitates the person for work on the following day or shift.  
(Continued on reverse side)

16-64361-4

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Form AEC-283 (Continued)  
(3-64)

## REPORT OF FIRE OR SIMILAR INCIDENT

## 8. CAUSE

(a) Deficiencies contributing to loss

See Committee Report

(b) Known (or probable) cause

See Committee Report

(c) What preventive action has been taken or contemplated?

See Committee Report

## 9. STORY AND RECOMMENDATIONS

On March 21, 1962 a fire occurred in a Norton grinder in the northwest section of Building 9766 and quickly spread through the duct system and completely involved the filters in the filter house located on the outside north of the building. Heat from the duct work ignited the under side of the decking and attic wall of the wooden structure. The filter bank was extinguished with water from the booster tank of a Fire Department Pumper and from a fire hydrant. The attic fire was controlled by water from a sprinkler system and completely extinguished with water from hose lines. The fire in the grinder was kept under control with water from the sprinkler system and extinguished with CO<sub>2</sub> from two 15 lb. fire extinguishers. Damage was estimated at \$24,700.00. There were no injuries. A Committee Report is being prepared, which will give complete details of the incident.

1c

Fire Dept. (Y-12 RC)		
Reported By W. J. Elam	Title Fire and Guard Dept. Head	Date 4-2-62

U. S. GOVERNMENT PRINTING OFFICE 16-64301-2

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APPENDIX E

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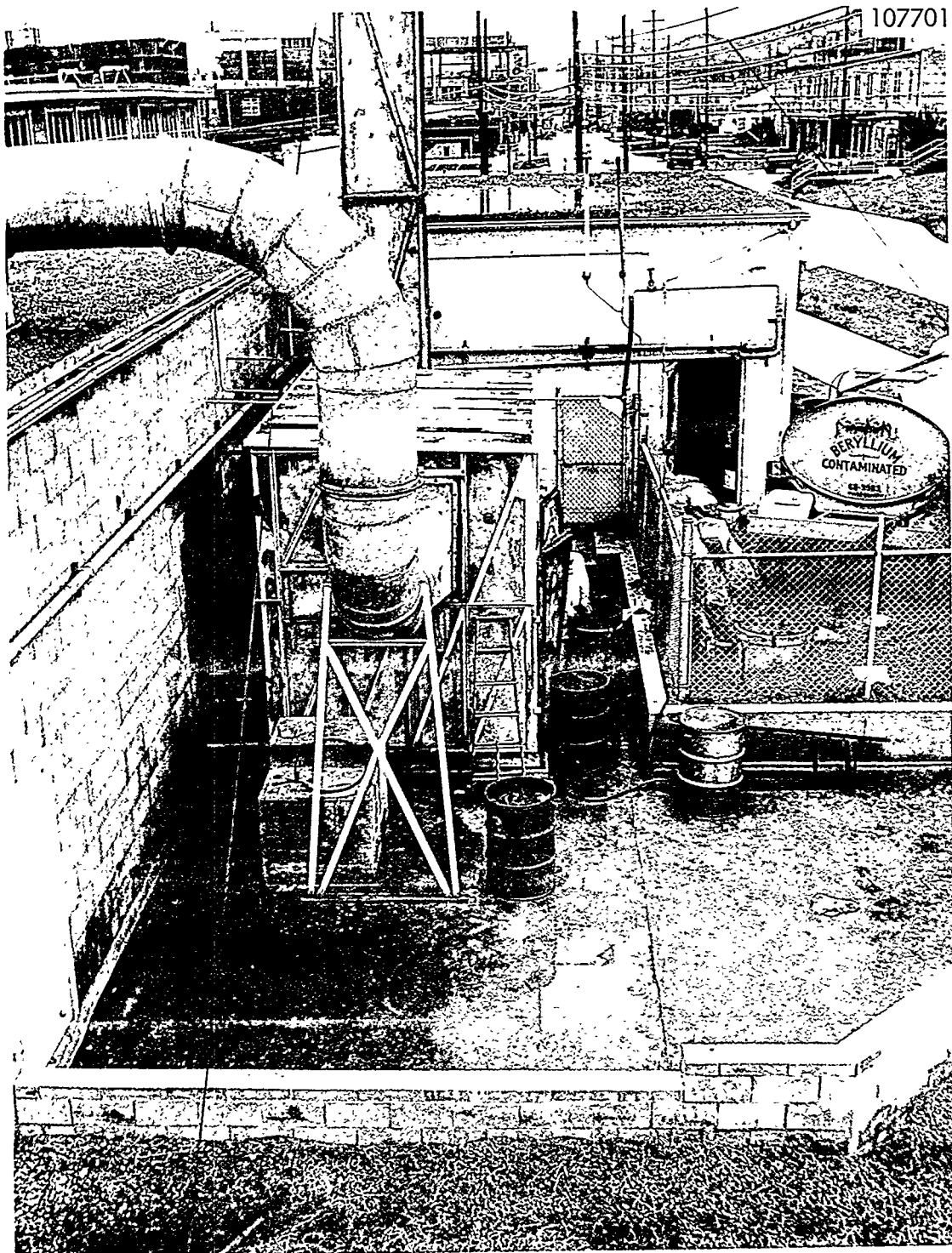


Figure E-1. OVERALL VIEW OF FILTER HOUSE.

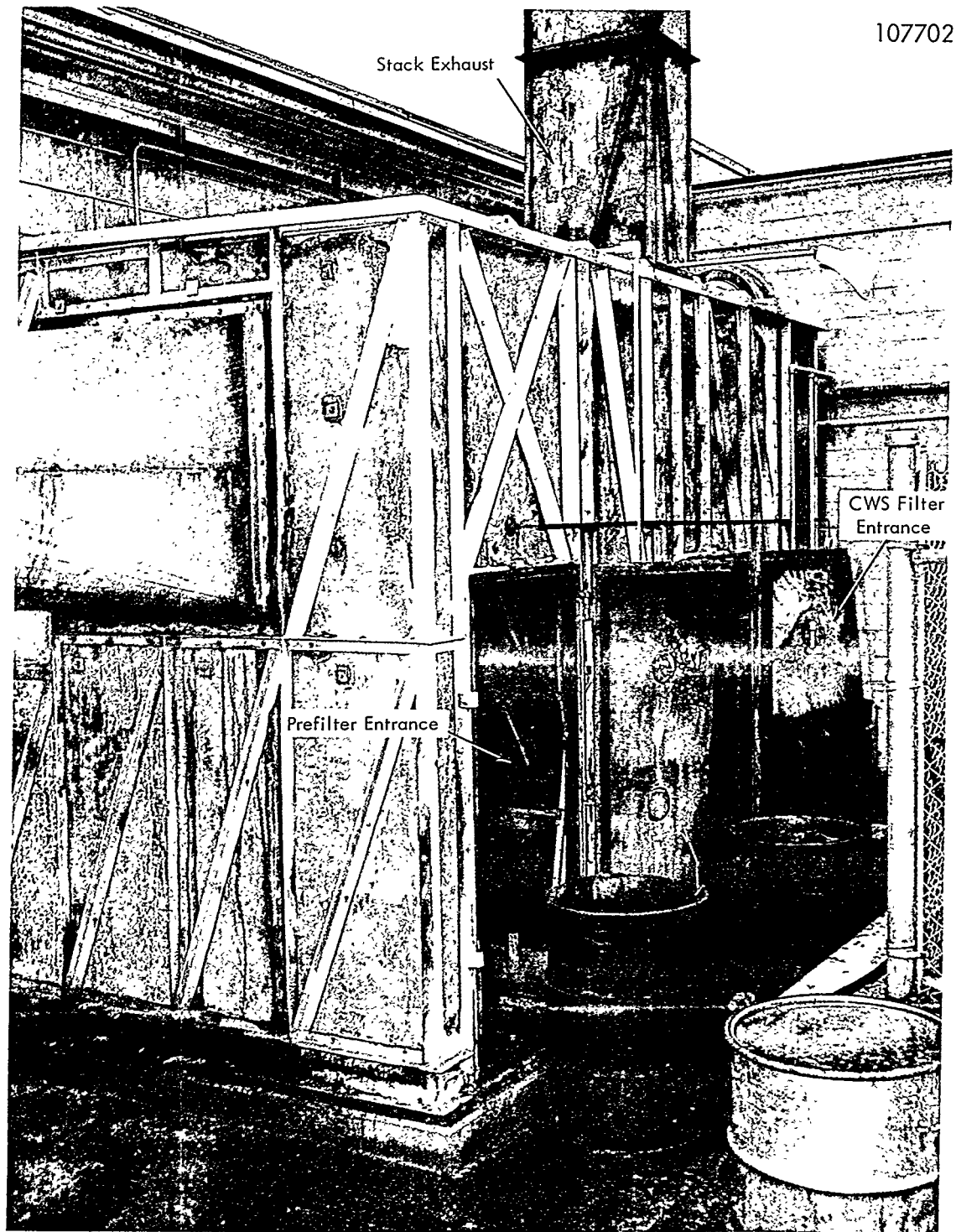
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Figure E-2. CLOSEUP VIEW OF FILTER HOUSE.

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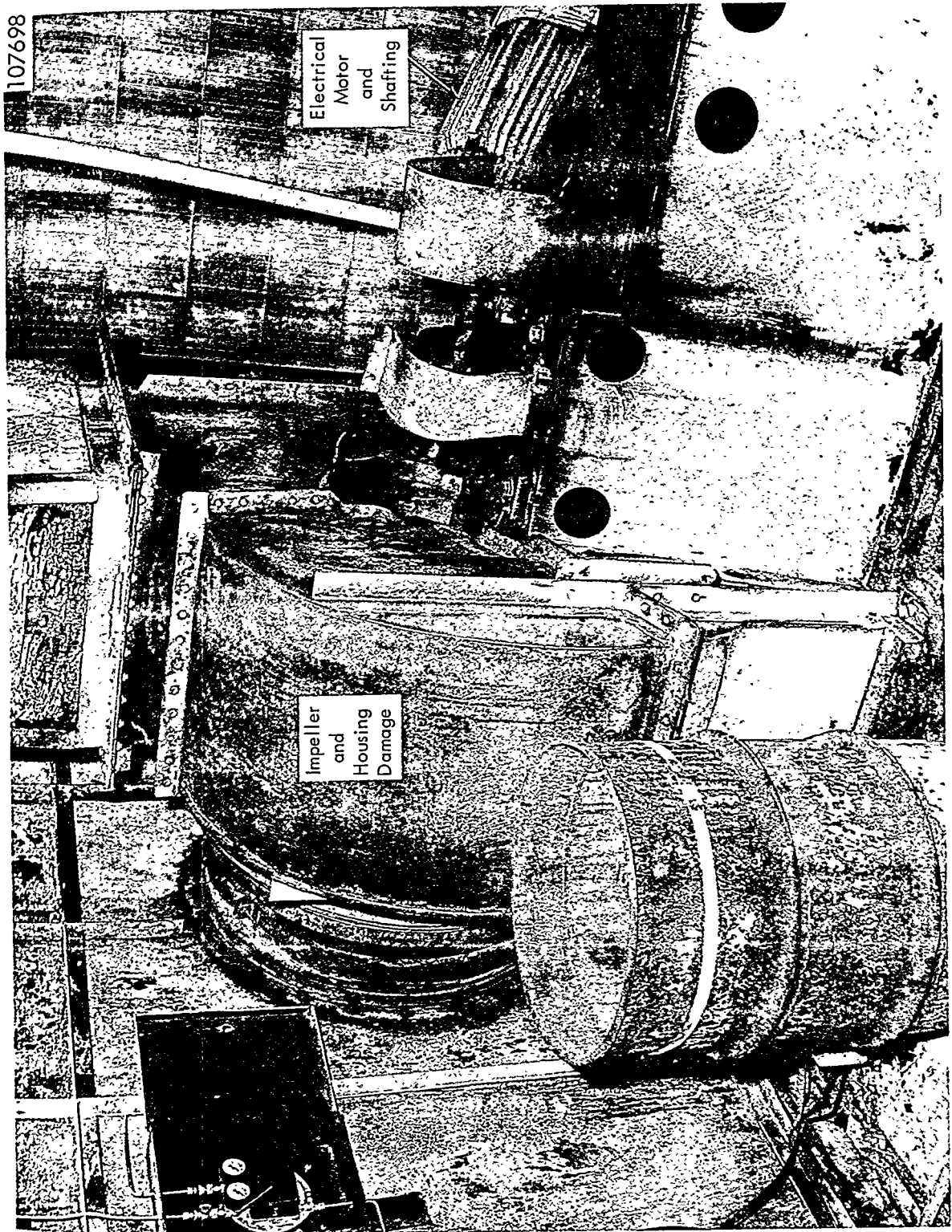


Figure E-3. FILTER HOUSE FAN.

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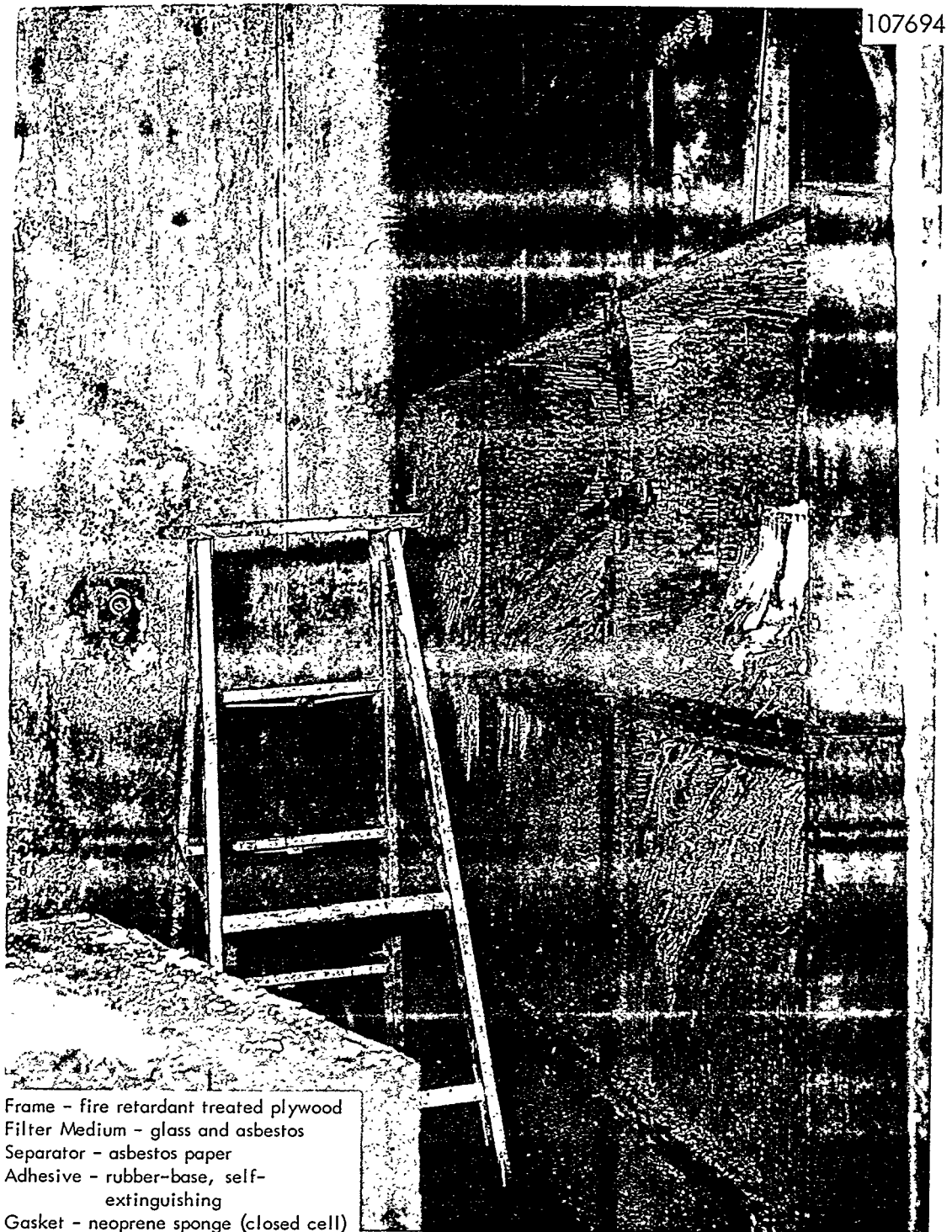


Figure E-4. CWS FILTER BANK.



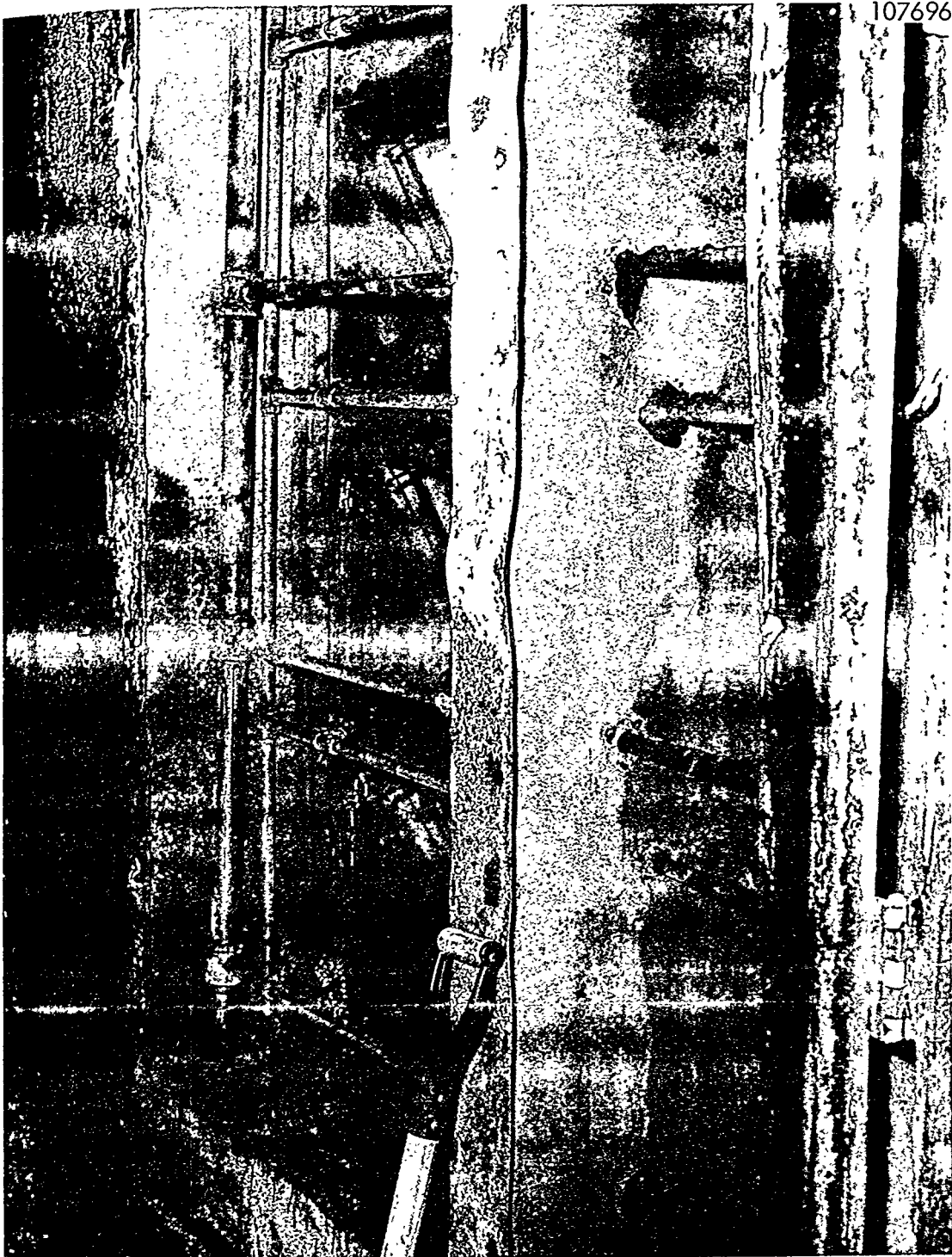


Figure E-5. STEEL PREFILTERS AND MANUAL WASH-DOWN SYSTEM.

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APPENDIX F

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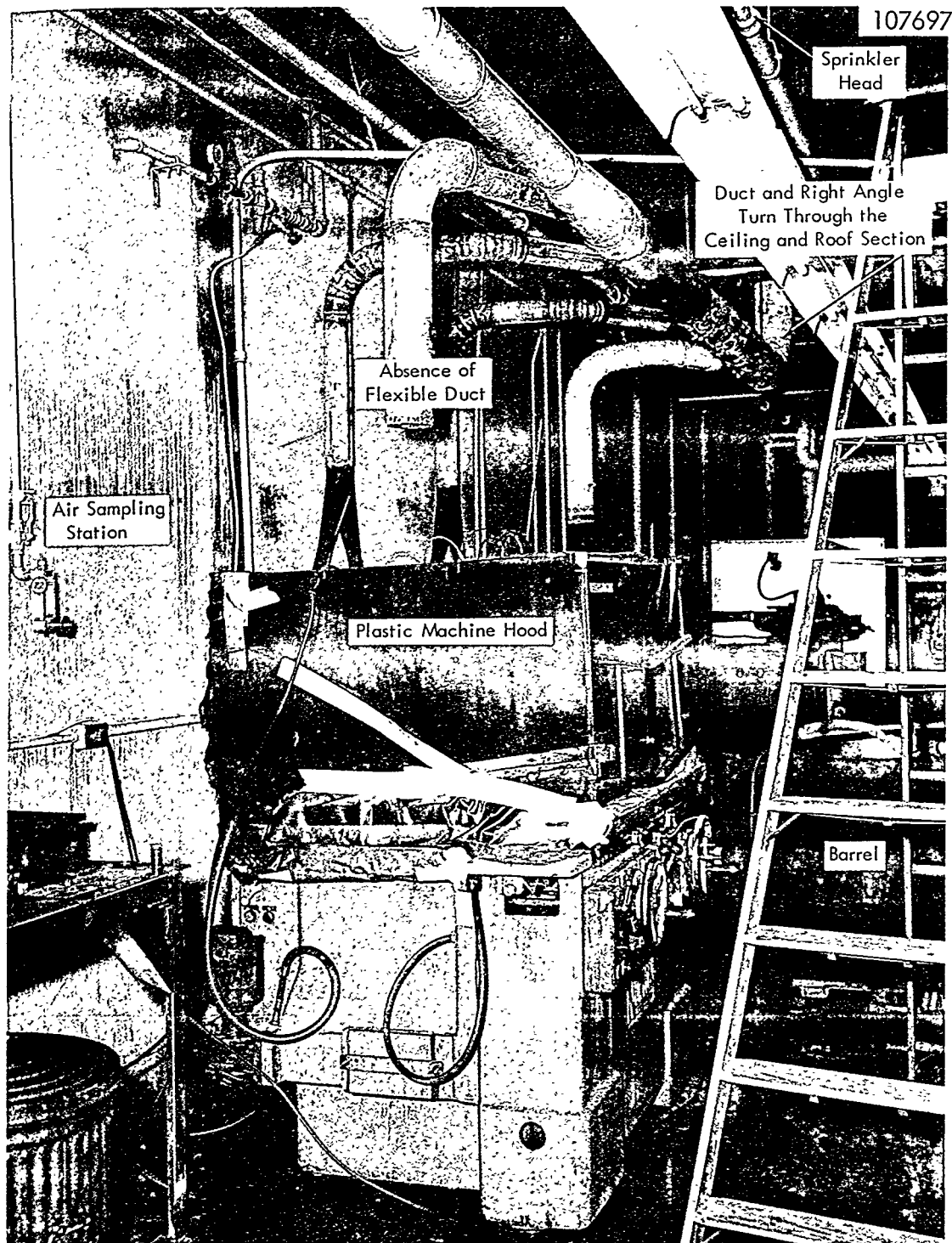


Figure F-1. OVERALL VIEW OF HOODED GRINDER.

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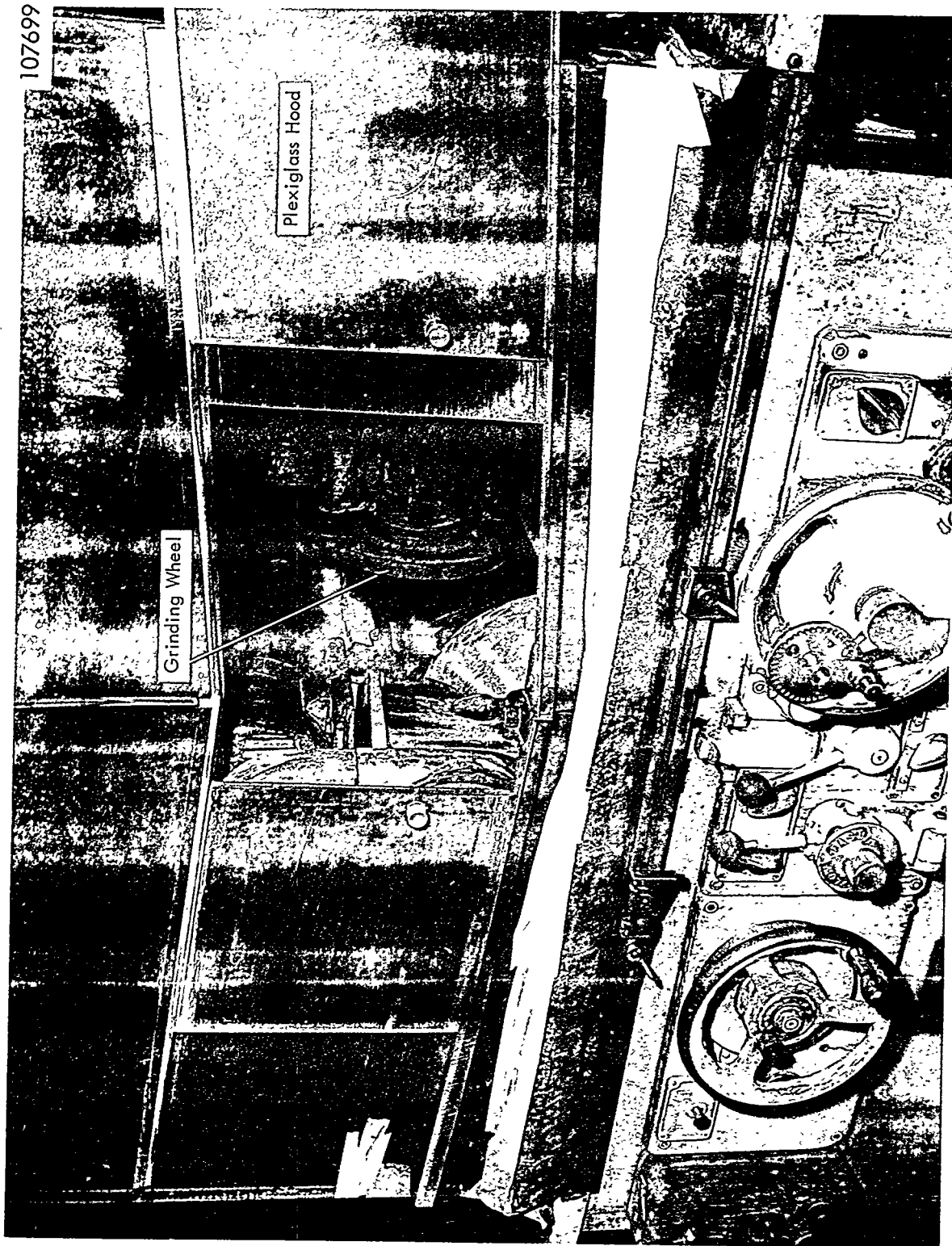


Figure F-2. CLOSEUP VIEW OF HOODED GRINDER.

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Figure F-2. CLOSEUP VIEW OF HOODED GRINDER.



Figure F-3. CHARRED ROOF JOISTS.

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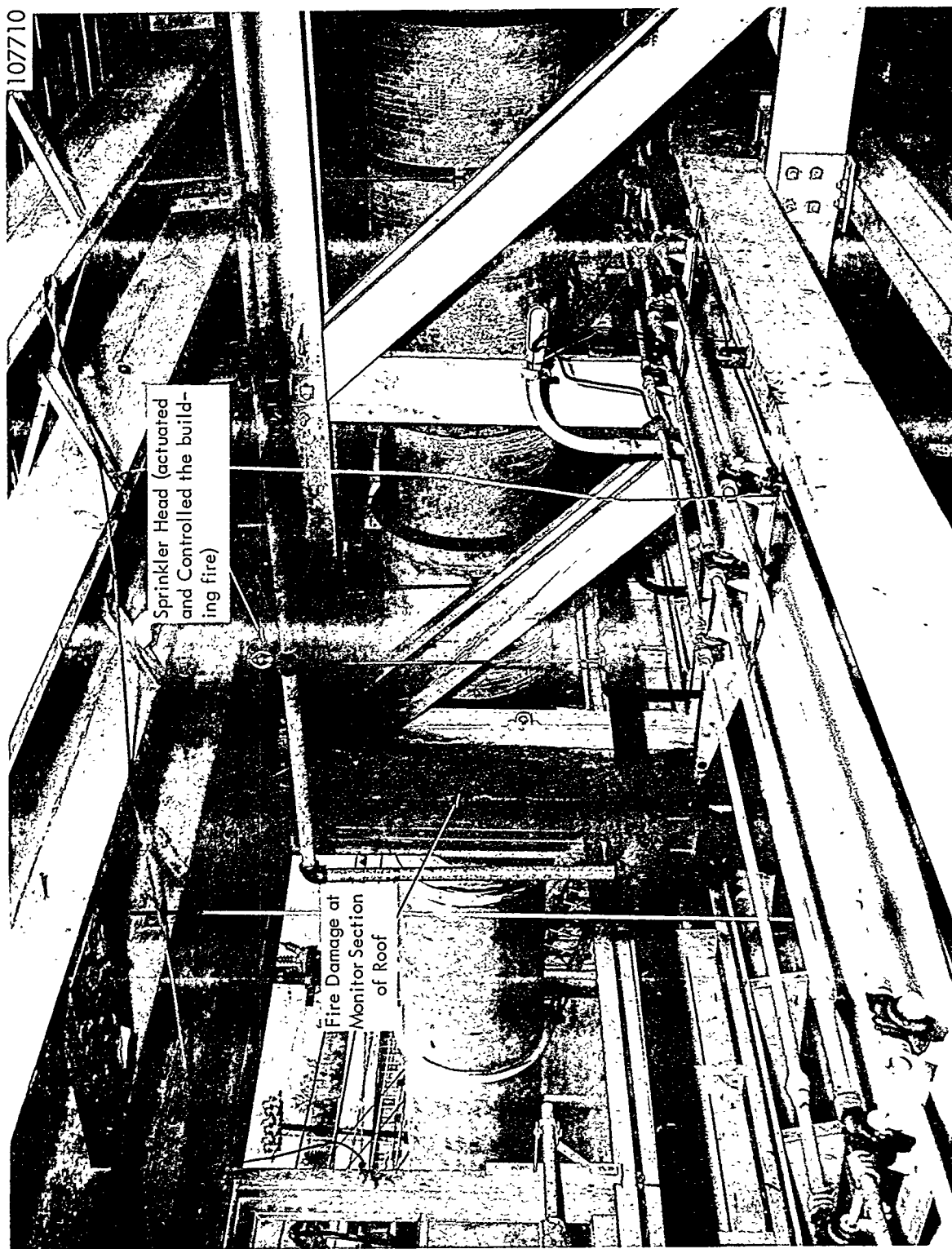


Figure F-4. VIEW SHOWING VERTICAL TRAVEL OF THE FIRE AND THE LOCATION OF THE SPRINKLER HEAD.

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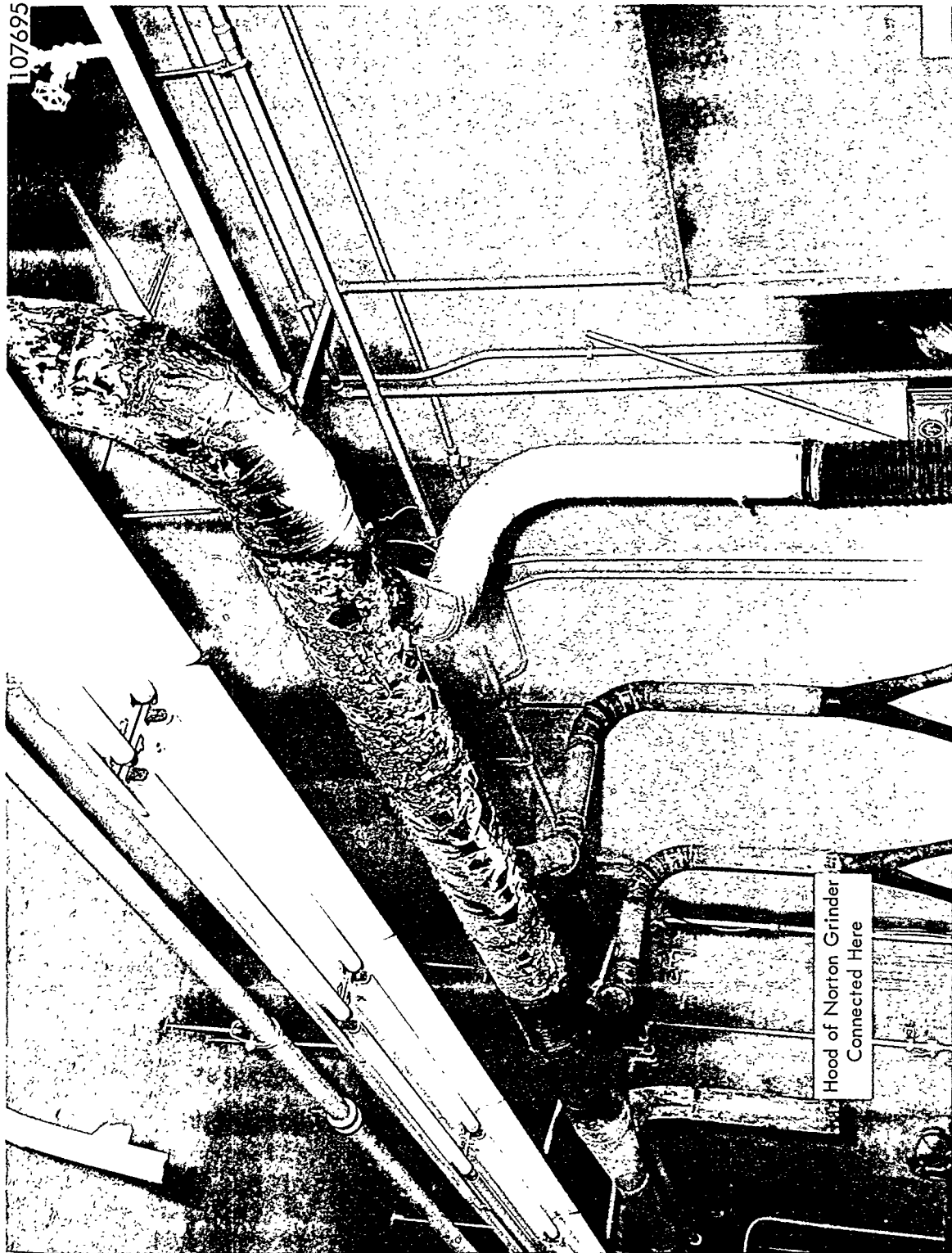


Figure F-5. EXHAUST DUCT SYSTEM FROM HOOD TO CEILING.

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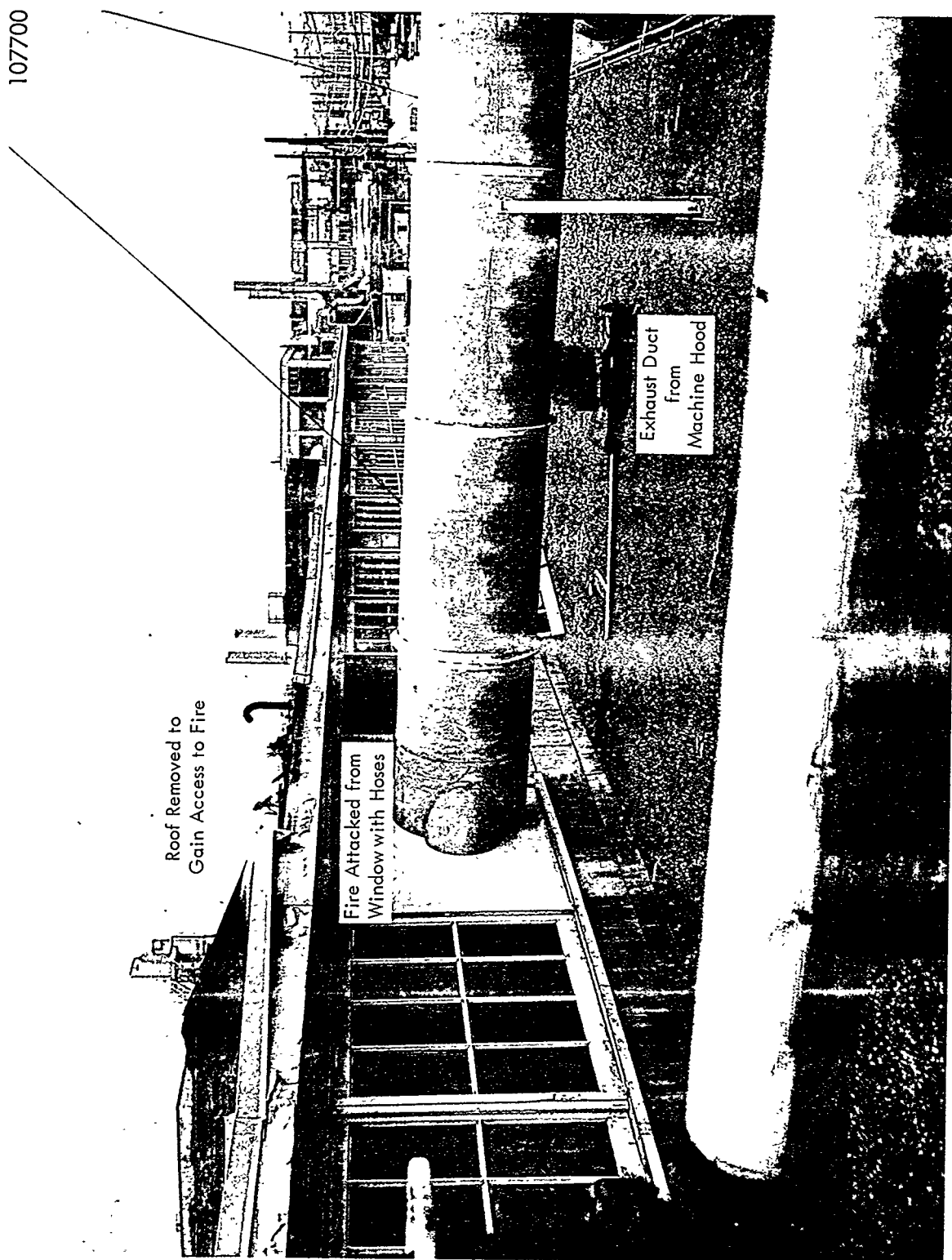


Figure F-6. EXTERIOR EXHAUST DUCT FROM MACHINE HOOD.

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APPENDIX G

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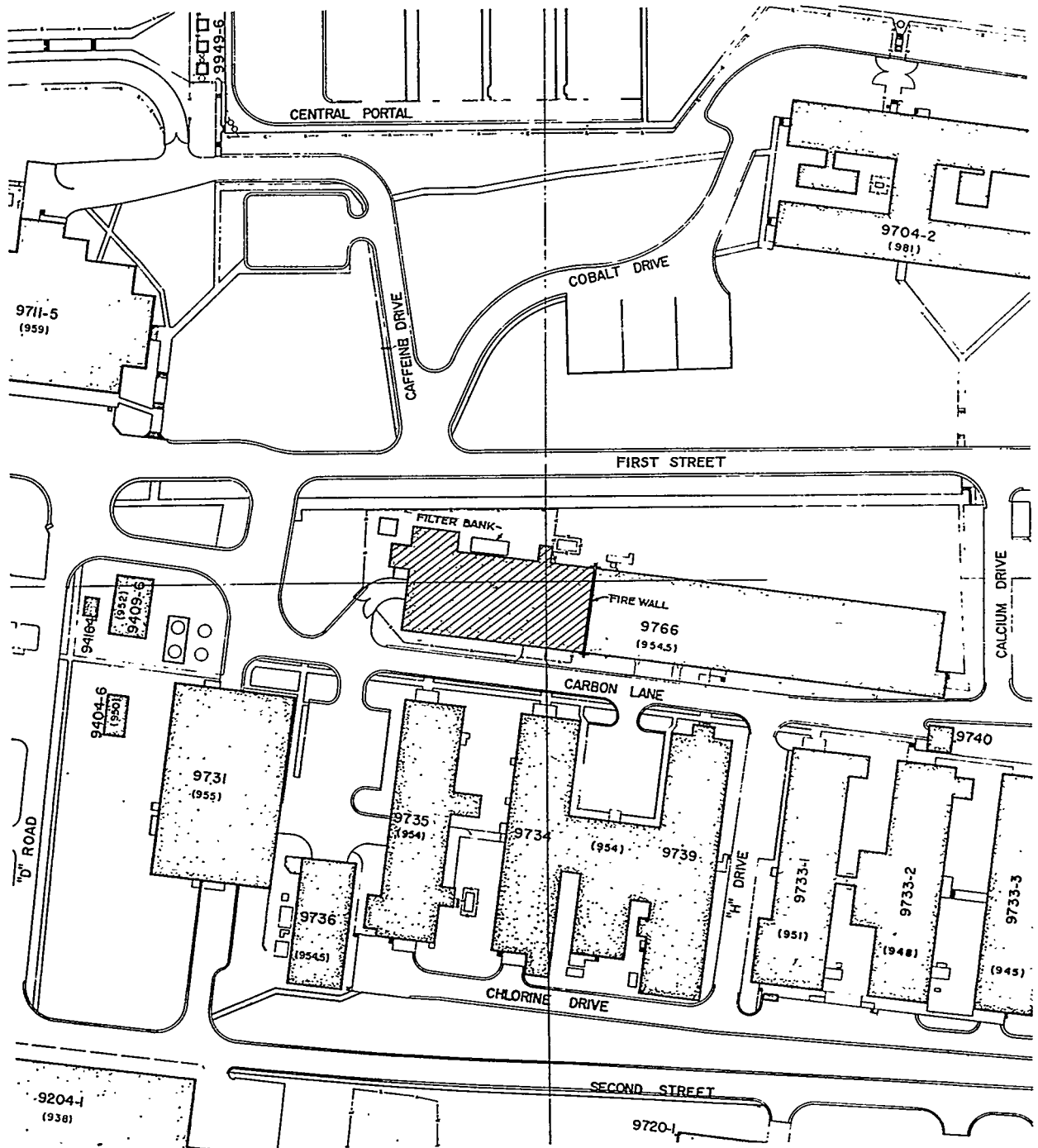


Figure G-1. AREA PLOT PLAN.